PH-AAA 312

PROPOSED RICE PRODUCTION ~~AND~~ EXTENSION PROJ~~ECT~~ IN BALIUAG, BULACAN

A JOINT REPORT SUBMITTED BY

THE CHINESE AGRICULTURAL
TECHNICAL TEAM
AND
ITS PHILIPPINE COUNTERPART

MANILA, PHILIPPINES
JULY, 1966

Manila, Philippines
July 8, 1966

His Excellency Fernando Lopez
Vice President and concurrently
Secretary of Agriculture
and Natural Resources
Diliman, Quezon City

Sir:

We have the honor to submit herewith our Report entitle "Proposed Rice Production and Extension Project in Baliuag, Bulacan".

This project proposal is developed as a result of our assignment referred to in the Memorandum of Understanding signed on May 6, 1966 between the Governments of the Republic of the Philippines and the Republic of China.

We appreciate having the privilege to serve, we are

Very respectfully yours,

Y. K. YANG
For the Chinese Agricultural Technical Team

EMILIANO P. GIANZON
For the Philippine Counterpart Team

TABLE OF CONTENTS

		Page
I.	Foreword	1
II.	The Chinese Agricultural Technical Team and Its Philippine Counterpart Specialists	3
III.	Selection of Project Site	5
IV.	Observations and Findings in Baliuag	7
	A. Rice Cultural Practices	9
	B. Irrigation and Drainage	10
	C. Services to Farmers	13
V.	Recommendations	16
	A. Rice Cultural Practices	16
	B. Irrigation and Drainage	20
	C. Services to Farmers	24
VI.	Proposed Rice Production and Extension Project in Baliuag	26
	A. Objectives	26
	B. Duration	26
	C. Pre-project Preparatory Work	26
	D. Organization	27
	E. Farm Supplies and Credit Requirement	31
	F. Operations	33
VII.	Appendices	37

FOREWORD

Pursuant to the agreement contained in a Memorandum of Understanding signed on May 6, 1966 in Taipei, Taiwan between His Excellency, Fernando Lopez, Vice President and concurrently Secretary of Agriculture and Natural Resources, the Republic of the Philippines and His Excellency, K. T. Li, Minister of Economic Affairs, the Republic of China and following the exchange of notes on May 17, 1966 in Manila, implementing the said agreement between the two countries, a 7-man agricultural technical team from the Republic of China arrived on June 12, 1966 to work with the Philippine Government in developing and planning a large-scale demonstration project for increasing rice production.

This report presents a summary account of the activities of the said Chinese team and a rice production and extension project proposal developed jointly by the team and its Philippine counterpart, for consideration and approval by the Philippine Government. It is hoped that the recommendations contained herein will be of benefit to rice production in the Philippines.

The Chinese agricultural technical team avails itself of this opportunity to express its sincere gratitude to the Philippine Government for the courtesies and hospitality accorded to all its members during their stay in the Philippines.

The team appreciates the kind assistance of the concerned agencies, particularly the Department of Agriculture and Natural Resources, the Rice and Corn Administration, the U.P. College of

Agriculture, the National Irrigation Administration, the Agricultural Productivity Commission, the Agricultural Credit Administration, the Land Authority, the Agricultural Tenancy Commission, the Bureau of Plant Industry, the Bureau of Soils, the Provincial Government of Bulacan, the Municipal Governments of Baliuag, Malolos and Gapan and the captains and farmers in the Barrios as well as the specialists from the International Rice Research Institute and the FAO, in obtaining the relevant information and data needed.

Acknowledgement is made of the untiring efforts and wholehearted cooperation of the Philippine specialists who worked as counterpart of the team, thus making this report possible.

II. THE CHINESE AGRICULTURAL TECHNICAL TEAM AND ITS PHILIPPINE COUNTERPART SPECIALISTS

A. The Chinese Team Consisted of Seven Persons as follows:

	Name	Persons
1.	Y. K. YANG (Team Leader)	Chief, Farmers Service Division, Joint Commission on Rural Reconstruction (JCRR)
2.	S. C. HSIEH (Rice Specialist)	Chief, Agronomy Division, Taiwan Agricultural Research Institute
3.	C. S. HSU (Rice Specialist)	Director, Chiayi Sub-station, Tainan District Agricultural Improvement Station
4.	T. T. LEE (Irrigation Engineer)	Chief, Irrigation Section, Designing Division, Taiwan Provincial Water Conservancy Bureau
5	C. T. CHENG (Irrigation Engineer)	Assistant Engineer Irrigation & Engineering Division, JCRR
6.	P. T. LIU (Farmers' Organization Specialist)	Specialist, Taiwan Provincial Farmers' Association
7.	SPENCER SHIH (Consultant/Secretary)	Executive Secretary, International Technical Cooperation Committee, JCRR

B. To work hand in hand with the Chinese Team, The Philippine Government assigned a counterpart Team composed of the following personnel:

	Name	Position
1.	EMILIANO P. GIANZON (Team Leader)	Regional Director Region No. 6 Bureau of Plant Industry
2.	JULIAN BULANADI (Agricultural Engr.)	Chief, Agricultural Engineering Division, Bureau of Plant Industry
3.	FELIX D. ENRILE (Rice Specialist)	Supervising Agronomist Bureau of Plant Industry
4.	CLEOFAS RODRIGUEZ (Rice Specialist)	Agronomist III Bureau of Plant Industry
5.	FELIX N. REGALADO (Irrigation Specialist)	Irrigation Superintendent National Irrigation Administration
6.	JUAN GOMEZ STA. ANA (Farmers' Coop. Spe.)	Agricultural Cooperative Agent, Agricultural Productivity Commission
7.	MIGUEL HERNAIS (Secretary	Agronomist III Bureau of Plant Industry

III. SELECTION OF PROJECT SITE

Accompanied by its Philippine counterpart, the Chinese Team began its work on June 14 and spent the first four days visiting the concerned agencies to receive briefings and acquire data on various aspects of agriculture in the Philippines, particularly in respect to irrigation, soils and fertilizers, agricultural extension, agricultural tenancy, credit and agricultural cooperative

Before any attempt could be made towards planning, the selection of an area suitable for the desired demonstration project on rice production increase was necessary. It was mutually agreed among the Chinese and Philippine specialists that the site for the contemplated project should be a place with sufficient irrigation water supply and soils of characteristics suitable for rice farming. Based on these requirements for choice of a project site, the Philippine counterpart suggested four municipalities, namely: Gapan of Nueva Ecija Province, Malolos and Baliuag of Bulacan Province and Camiling of Tarlac Province, all in Central Luzon. However, Camiling was soon found undesirable because its soils are sandy loam with high degree of phosphate deficiency and its irrigation water supply is not dependable as it is located at the downstream of the Camiling River Irrigation System.

As a result of a preliminary field investigation conducted in the other three Municipalities comparing the existing conditions pertaining to (1) irrigation, (2) drainage facilities, (3) rice cultural practices, (4) soils, (5) cooperatives, (6) extension services, (7) agricultural tenancy, (8) consolidation of irrigated farms, (9) area of irrigated land and (10) average yield of rice, Baliuag of Bulacan was finally chosen, by mutual decision to be the site of the said contemplated project.

IV. OBSERVATIONS AND FINDINGS IN BALIUAG

In order to acquire further information and more data for developing a project proposal, the Chinese and Philippine specialists jointly made a five-day (beginning June 20) on-the-spot analytic study of the actual rice production and socio-economic situation in Baliuag, largely through interviews with local farmers and Barrio Captains.

Situated 50 kilometers north from Manila, Baliuag is a Municipality in Bulacan Province. It has 3,400 (approx.) hectares of irrigated farm land, about 90% of which is planted to two rice crops annually. These farms are distributed in 21 Barrios as shown in Table 1, on page 8. They are operated by 1,600 (approx.) farm families, of whom 340 are not the residents of the Barrios where they farm. About 93% of Baliuag farmers are share tenants, sharing the rice crop with their landowners generally on a 50%-50% basis.

As Baliuag is along the national highway, practically it has no problems of transportation and warehousing which are important facilities in effecting ready supply of farming materials to farmers and in the marketing of their products.

TABLE 1 - NUMBER OF FARM FAMILIES AND AREA OF IRRIGATED FARMS LAND IN BALIUAG

Name of Barrios 3/	Number of Farm Families Operating in the Barrio 1/ Resident	Non-Resident	Total	Area of Irrigated Farmland 2/ (Hectare)
Hinukay	42	18	60	90
Paitan	42	18	60	198
San Roque	90	10	100	150
Piel	41	5	46	83
Sto. Niño	47	8	55	143
Barangca	75	23	98	154
Tangos	47	50	97	73
Sabang	76	8	84	112
Pagala	80	-	80	121
Sto. Cristo	30	-	30	135
Riles	2	2	4	5
Sullivan	40	-	40	46
Tilapayong	80	5	85	154
Concepcion	25	-	25	47
Tarcan	40	-	40	29
Pinagbarilan	30	50	80	177
Calantipay	150	50	200	341
Matangtubig	96	15	111	502
Catulinan	30	24	54	151
Sta. Barbara	100	-	100	126
Makinabang	80	55	135	586
TOTAL - -	1,243	341	1,584	3,423

1/ Based on the reports of Barrio Captains in a survey conducted by the Team.

2/ Based on the data supplied by the Office of the Irrigation Superintendent, Angat & Maasim Rivers Irrigation Systems, Plaridel, Bulacan.

3/ In Baliuag, there are five barrios - Tiaong, Poblacion, San Jose, Subic and Virgen delos Flores - not included in the above Table because of no rice fields.

A. Rice Cultural Practices

Rice is cultivated two times a year in Baliuag, 1st crop (wet season) is from May to early September, while the 2nd crop is from late September to early February. During the period of late February to early May, nothing is grown in the field due to lack of irrigation water. Rice fields occupy the vast area. Approximately, one third of the soil in Baliuag belongs to Quingua silt loam type, while the other two thirds belong to the Bigaa clay loam type. Quingua soil is considered to be better than Bigaa soil in texture and fertility. However, both are good for rice cultivation.

The local Indica type varieties, BINATO AND INTAN, which are not seedboard varieties are cultivated exclusively in this area. BINATO is a non-seasonal early variety which matures in 120 days from sowing. This variety always lodges when a little amount of nitrogen fertilizer is applied. Likewise, INTAN is also a non-seasonal lodging variety maturing in 148 days. However, due to its good eating quality and high commercial value, it is cultivated widely during the 2nd crop season. Because of its lodging character, not very much fertilizer is applied in general, except by some progressive farmers who apply fertilizers with special care. The average yield per hectare for BINATO is around 40-50 cavans while that of INTAN is around 50-60 cavans.

Though the government recommends an elevated striptype of seedbed, yet it is not popularly practised. Seedlings are usually 30-35 cm. in height (30 days old) which are deemed too tall and too old to be planted. Approximately, 20 to 30% of seedlings are damaged through the widespread indiscriminate practice of pulling the seedlings.

There is no uniformity in the number of plants transplanted per hill which ranges from three (3) to as many as twenty (20) per hill.

Straight row planting in one direction is practiced by few farmers. Weeding is not very common in this area. Blast disease is relatively not serious. But according to the information of the IRRI pathologist and entomologist, Tungro and bacterial blight are becoming important diseases in the Philippines. Rice stem borers and leafhoppers are the important insect pests which cause severe damage to rice in this area. Application of insecticides and fungicides is practised only in the demonstration fields but not popularly adopted by the farmers. Farmers have water buffalos plows and harrows but they do not have tools for land levelling. Hence, the land preparation is not thorough. No small portable thresher is being used during the harvest season.

B. Irrigation and Drainage

(a) Irrigation:

1. Conveyance System (Main canal laterals and Sub-laterals) - Many canals of the system have been eroded and the height of the bank dikes is also insufficient due to lack of maintenance. The system is not lined. It is believed that the conveyance losses in the system are large especially during the

water shortage period. It is apparent that the design capacities of canals are inadequate to meet future requirements.

Many checks have been installed in the main canal and the laterals, but the water measuring facilities are apparently wanting except for some wator gauges installed at the intakes of the North and the South main canals. From the points of view of effective water management, the existing checks lack "mobility".

2. Farm Distribution System - The number and length of farm ditches are insufficient and irrigation water is conveyed through many parcels, or from plots to plots, and to irrigate the lots far from the laterals a lot of water and time is lost. Turnouts are also in poor condition and many of them are not functioning.

3. Area Irrigated - Records show that the total irrigated area of the Angat River Irrigation System is 26,928 hectares, divided between and served by the North and South canal systems. The total irrigated area of the proposed Baliuag project is 3,420 hectares, of which 2,900 hectares are double crop rice fields and 520 hectares are single crop rice fields. Most of the single crop fields are located at the upstream portion of the laterals. These fields are irrigated directly from the main canal by means of forced checking to raise the water level. In order to avoid loss of water caused by forced checking especially during water shortage period, these fields can better be irrigated by temporary pumping facilities. But after the completion of the National Power Corporation Hydroelectric Project in 1967, more water will be available

to the system. These high lands may then be irrigated by gravity and can be converted into double crop fields.

4. Irrigation Operation and Management - With reference to the cropping pattern and irrigation water requirement in 1966 for areas covered by the Angat River Irrigation System (see Appendix 1), it is evident that water shortage may occur during the irrigation period, but this water shortage may be overcome by better irrigation management and, therefore, the production of paddy will not be largely affected.

Considering the design capacities of the North main canal (Design Capacity - 18.00 CMS). and its related laterals, the system may be divided into three or two rotational zones for irrigation operation, according to the available discharge of water source. It seems that two of three rotational zones can be irrigated at the same time, when the diverted discharge reaches about two-third of design capacity of the North main canal. If the available discharge of water source is only half of main canal capacity, the system can be divided into rotation divisions in accordance with existing laterals of the irrigation system for good irrigation operation and management work.

The twelve-pesos-per-hectare annual irrigation fee is considered too low for the minimum requirement of irrigation operation and maintenance needs of the system.

(b) Drainage:

The drainage facilities in Baliuag are utterly inadequate, and what is existing was found in bad condition. Except for the natural creeks, the existing drainage ditches are scarce, extremely silted and badly in need of maintenance. Some of them have no outlets. The drainage system needs improvement in accordance with topographical conditions. Effective drainage will prevent water logging in the low sections of the land, although the water requirement of the area may be increased due to the improvement of drainage system. The ground water table of lands along the banks of laterals and lower places seems relatively high.

C. Services to Farmers

1. Farmers' Cooperative - The Baliuag FaCoMa which was organized in 1953 has a total membership of 1,431 farmers from Baliuag and four other nearby municipalities in the Province of Bulacan and Pampanga. Among them, 759 members were from 25 Barrios in Baliuag. The FaCoMa has various facilities for rendering services for its members including one warehouse, one rice mill, one dryer, one truck, one jeep and one office building. The warehouse has a storage capacity of 47,000 cavans of paddy. The capacities of the mill and dryer are 300 and 600 cavans of paddy, respectively, per 12 hours continuous operation.

These facilities were procured/built with loans from the then Agricultural Credit and Cooperative Financing Administration (ACCFA), the predecessor of the Agricultural Credit Administration (ACA).

Major activities performed by Baliuag FaCoMa from 1953 to 1963 included extension of loans, supply of chemical fertilizers, milling, drying and warehousing of palay for its members. During the above-mentioned period, the cooperative association was operated quite satisfactorily and its financial surplus was distributed to the members as patronage refund. However, due to mis-management in 1964, the FaCoMa has suffered a loss of more than 100,000 pesos and, consequently, the members have lost their confidence in and declined to deal with the FaCoMa.

Since 1964, regular meetings of the board of directors and the annual meetings of the FaCoMa have not been called for. The management of the cooperative is now undertaken by a manager, without the sanction and supervision by the board of directors. The rice mill is being operated and has milled about 10,000 cavans of palay since March, 1966. Most of these palay are entrusted by non-members in the area.

As of December 31, 1965, the outstanding amount of loans extended previously by ACCFA to Baliuag FaCoMa was ₱449,855.45. These loans have not been repaid because the FaCoMa has not yet settled the accounts of palay the members deposited with the cooperative.

2. Agricultural Credit Service - In the town proper there is a rural bank but most farmers do not avail themselves of the loans from the Bank particularly because of the collateral requirement which the tenant-farmers can not meet. In view of the above reason and the inactiveness of Baliuag FaCoMa, the Branch office of the Agricultural Credit Administration (ACA) in Bulacan is now extending

production loans and distributing fertilizers directly to the farmers During the past two years (1964 and 1965) only ₱3,370 production loans were extended to 142 farmers. In addition, 2,013 bags (45 kg. each) of fertilizers were distributed, of which 319 bags were sold in cash and 1,694 bags on loan basis. However, there is no farm improvement loan or commodity loan extended by ACA to farmers in Baliuag.

The rate of interest charged by ACA on production loans and on loans of fertilizers in kind is 8% per annum which is much lower than that of the Rural Bank. However, the supply of credit from ACA is still far behind the actual need of the farmers in the area. To support the proposed rice production extension project in Baliuag, a special loan project is needed.

3. Agricultural Extension Service - At present, the Agricultural Productivity Commission has eight extension workers stationed in Baliuag. Among them are five farm management technicians, two home management technicians and one rural youth officer. To educate farmers how to increase rice production, five farm extension clubs with a total membership of 262 farmers, have been organized in five barrios, namely: San Roque, Sabang, Tilapayong, Tarcan and Calantipay. However, their operations have not been effective in causing rice production increase.

V. RECOMMENDATIONS

To achieve rice production increase in Baliuag, the following recommendations are presented on the basis of actual field investigation and in consultation with local specialists:

A. Rice Cultural Practices

1) To use non-seasonal varieties that are high-yielding, stiff-strawed, nitrogen-rseponsive and resistant to pests and diseases.

IR8-288-3 and BPI-76 (Bicol selection) of short growth duration (120-125 days from sowing to harvesting) are suggested to replace the local varieties BINATO and INTAN for any crop season. (See Appendix 2).

2) To adopt an elevated seedbed.

An elevated seedbed of 1 m. x 20 m. with a 30 cm. wide ditch in-between is suggested for more convenient care of the seedlings. This is not commonly practised by the farmers in Baliuag.

3) To use young seedlings of not more than 20 days old. Baliuag farmers use seedlings of more than 30 days old, and about 30 cm. in height which are too tall and too old to be planted. Therefore, the planting of seedlings of 15-20 cm. in height with 4-5 leaves and approximately 20 days is suggested.

4) To improve the technique of pulling seedlings.

The team also observed that approximately 20-30% of the seedlings are damaged due to the common practice of pulling the seedlings in a hurry. Care should be exercised in pulling the seedlings. To prevent too much damage to the seedlings during the pulling stage, the raised seedbeds should be thoroughly irrigated one day before pulling. The Taiwan method of spading seedlings from the seedbed instead of pulling may be adopted.

5) To use levelling pole or pulverizing roller to level land before transplanting.

It was observed during the field survey that after harrowing no land levelling is done by most farmers. Land levelling is quite important for uniform transplanting which has great bearing on the yield of rice. It is suggested to use a levelling pole attached to the harrow for the final levelling of the paddy field., The adoption of the Taiwan type of pulverizer roller is also recommended, because this implement not only pulverizes the soil and mixes plant residues into the soil but also performs the land levelling job.

6) To transplant at a shallow depth and in straight lines in both directions.

In Baliuag, the depth of planting is not uniform ranging from 2 to 5 cm. It is suggested that more experienced workers be hired instead of children so as to assure uniform transplanting of seedlings to as shallow as 2 to 3 cm. There is no uniformity in the number of seedlings transplanted per hill. It ranges from three to as many as twenty per hill. Too many plants per hill reduce the number of effective tillers; therefore, the planting of 3 to 5 plants per hill is strongly recommended. However, in case there is a shortage of seeds of the varieties recommended for this project, the planting of one (1) seedling per hill is suggested.

The use of a check-row space marker or distance-marked bamboo pole is recommended in order to make straight-line planting in both directions. The use of transplanting snapper made of either metal or bamboo to protect the thumb is also suggested.

7) To adopt the split fertilizer application for Bigaa clay loam and Quingua silt loam soils.

For the Bigaa clay loam of Baliuag, the following amount of fertilizer is recommended after consultation with the Bureau of Soils:

Variety Name	September - January			May - August		
	N	P	K	N	P	K
IR 8-288-3	80	40	(0-40)	70	40	(0-40)
BPI-76 (Bicol sel.)	60	40	(0-40)	50	40	(0-40)

According to the Bureau of Soils, potassium response is not significant in Bigaa clay loam and Quingua silt loam. Therefore, from the economical point of view, no potassium is to be applied in the coming crop season (Sept. 1966 - Jan. 1967). However, application of potassium at the suggested rate is needed in the future so as to maintain soil fertility. The suggested amount of fertilizer for Sept. 1966 - Jan. 1967 crop is as follows:

Bigaa clay loam

Variety	September - January			May - August		
	N	P	K	N	P	K
IR8-288-3	80	30	0	70	30	0
BPI-76 (Bicol sel.)	60	30	0	50	30	0

Quingua silt loam

Variety	September - January			May - August		
	N	P	K	N	P	K
IR8-288-3	80	30	0	70	30	0
BPI-76 (Bicol sel.)	60	30	0	50	30	0

Apply the whole amount of phosphate and potassium and two-thirds (2/3) of the amount of nitrogen as the basal dressing while the other one third (1/3) of nitrogen is top-dressed 60 days before harvesting or 30 days before flowering.

8) Effective control of insects and diseases.

As stem borer is a common problem in the Philippines, timely application of BHC is suggested. Use of Sevin-85 at the proper time is strongly recommended to control leaf hopper vectors transmitting Tungro and other virus diseases. (see OPERATIONAL CALENDARS on Pages and Appendix 3 for easy determination of the amount of wettable powder and granules as well as the desired spray concentrate).

9) To weed paddy field at least twice so as to ensure thorough elimination of weeds in the field.

According to our survey, very few farmers practice weeding. Weeds are as high as the rice plant. Complete weeding either by rotary weeder or hand weeding to avoid wasteful consumption of fertilizers by weeds is strongly suggested.

10) To use pedal rice-thresher to thresh rice grains.

No portable thresher has been used in Baliuag. Farmers usually transport the harvested rice to an open ground for threshing by beating the rice stalks against the gound, or thresh it by a team of water buffalos. These methods are not only ineffective but also causes heavy loss of grains during the transportation of rice stalks.

The two-man-operated pedal rice-thresher manufactured in Taiwan is recommended to be used. It is a cylinder-type revolving thresher with a grain receiving box mounted on sleds so that the whole unit can be towed on the half-dried or even wet paddy field.

11) Necessary agricultural tools.

To adopt the above-mentioned modified Taiwan method of rice cultivation, farm implements listed below are necessary:

1. Knife tooth harrow	20
2. Paddy field pulverizing roller	20
3. Check-row spacing marker	30
4. Transplanting snapper (thumb protector)	200
5. Seedling spade	30
6. Seedling tub	30
7. Pedal rice thresher	15
8. Power tiller engine operated thresher (same as 7 except motor operated)	5

B. Irrigation and Drainage

(a) Immediate and Short-Range Program:

1. Additional and more farm ditches and turnouts should be constructed at suitable places based on a topographical map of the project area on a suitable scale. Gates with locks should be provided at every turnout for effective water distribution and control.

2. Drainage ditches should be constructed at appropriate places while existing ones should be desilted, improved and provided with outlets to main drains especially those in water logged areas.
3. The canal embankments should be raised to appropriate heights sufficient to carry the discharge especially at places where the water levels in the canal are higher than the land and where water conveyance is difficult.
4. Irrigation schedules and crop patterns should be effected in different periods. Irrigation operation men should be given a well-rounded training on these schedules for efficient and effective implementation of irrigation program in the area.
5. Irrigation association with irrigation small groups in each lateral and sub-laterals must be organized to insure good maintenance and operation of irrigation facilities and also to provide equitable distribution of water to farmers' fields and at the same time encourage them to appreciate its value and participate in irrigation activities.
6. Irrigation fees should be increased to a reasonable level to promote and cope with the effective operation needs of the system.

7. A more thorough and factual delineation of water shortage areas should be undertaken for future and further improvement studies on the same.
8. Rainfall, discharge and evapo-transpiration should be made continuously in the whole system area for the purpose of estimating more precisely effectual irrigation water requirement necessary for irrigation and drainage planning studies.
9. Ground water table observations should be carried out in the project area, if actual conditions will not permit coverage of the whole system area.
10. Single crop areas of the project should be converted into double crop by installing temporary pumping facilities.

(b) Long-range Program:

1. Checks with stop planks on main canal and laterals should be replaced with sluice gates with locks for a more effective water distribution and control of irrigation water.
2. Measuring devices should be provided at beginning points of laterals and sub-laterals for immediate determination of discharge.
3. Canal lining works should be considered for future improvement of the system to minimize water losses.

4. Additional utilization of return flow should also be effected as supplemental irrigation water source. Weirs may be adopted to divert the water for beneficial use without hampering drainage efficiency. Otherwise, pumping stations should be adopted.

After strenghtening the irrigation operation and management of the system, the water saved can be conveyed to the downstream areas of the system, the additional benefits from the project will redound to the economic well-being of more farmers dependent on more irrigation water.

C. Services to Farmers

The success of the proposed rice production and extension project will depend greatly, among other things, on the effectiveness of services rendered to farmers in the fields of credit, farm supply and extension. Normally, a farmers cooperative can be an effective channel to render such services. However, since the Baliuag FaCoMa has been inactive and the farmers' need for these services under the proposed project is very urgent, it is recommended that the following measures be taken:

(a) For Immediate Action

1. Pending the completion of revitalization of the Baliuag FaCoMa, ACA undertake the responsibility of extending production and farm improvement loans directly to all the farmers participating in the proposed rice production project.

2. By the same token, ACA will also handle the supply of fertilizers, pesticides, seeds, etc. to the farmers.

3. The rate of interest charged by ACA be set at 8% per annum for both the farm production loans in cash and in kind such as fertilizers and pesticides.

4. The existing facilities of the Baliuag FaCoMa be used by ACA for credit and supply operations.

5. Procedures for loan application, processing and release be simplified in order that the farmers will be able to obtain the loans on time.

6. To assure loan repayments by farmers on schedule in addition to constant supervision by extension workers over the end use of loans, a group guarantee system be adopted.

7. A sum of approximately 1,870,000 pesos (see Page 32) be made available by ACA for the crop season of September 1966 to January, 1967.

8. In the crop season of September 1966 to January 1967, the following supplies be made available to farmers by ACA:

1. Rice seeds : 150 M/T)
)
2. Fertilizers : 1,340 M/T) - (see Page 31)
)
3. Insecticides : 143 M/T)

(b) For Reactivation of Baliuag FaCoMa

(1) ACA and APC be requested to assist FaCoMa to call a general meeting of its m re-election of a new board of directors of before the end of August, 1966. A capable selected and appointed within one month aft board of directors is established.

(2) Under the guidance of the board of with technical assistance of officials of the manager should prepare a workable plan take over the credit and supply services wh handled by ACA temporarily.

(3) All the farmers participating in th rice production and extension project be en join the FaCoMa in order to obtain various through the FaCoMa, when it is in effective

VI. PROPOSED RICE PRODUCTION AND EXTENSION PROJECT IN BALIUAG, BULACAN

A. Objectives:

1. To educate the rice farmers in the integrated application of improved rice cultural methods (as recommended in Part V of this Report).
2. To demonstrate how to increase rice production through proper planning and coordinated efforts at the Municipal level of different agencies.
3. As a pilot project, to effect an immediate increase in rice production.

B. Duration : For a period of two years beginning September 1, 1966.

C. Pre-project preparatory work

1. The farm tools, rice seeds, fertilizers and insecticides as mentioned on Pages 20 & 24 should be made available before September 1, 1966.
2. The recommendations Nos. 1, 2 and 3 on Pages 20 & 21 pertaining to irrigation and drainage should be implemented also before September 1, 1966.
3. A detailed socio-economic survey (see Survey Form, Appendix 4) of all farm families in Baliuag should be undertaken and completed on or before August 15, 1966 to serve as basic information to facilitate

implementation of this project and provide a yardstick for post-project comparison.

4. If necessary and when time permits, the key personnel to be assigned to this proposed project be sent under USAID TA Program for a two-week observation of the agricultural program in Taiwan Province of the Republic of China, prior to the project implementation.
5. Recruit, through bilateral agreement with the Government of the Republic of China, a rice farming team of 15 extension workers plus 4 technicians from Taiwan (including on extension specialist as team leader, one rice specialist, one irrigation specialist and one credit and cooperative specialist) to arrive in the Philippines around August 15, 1966 to assist in the implementation of this project.

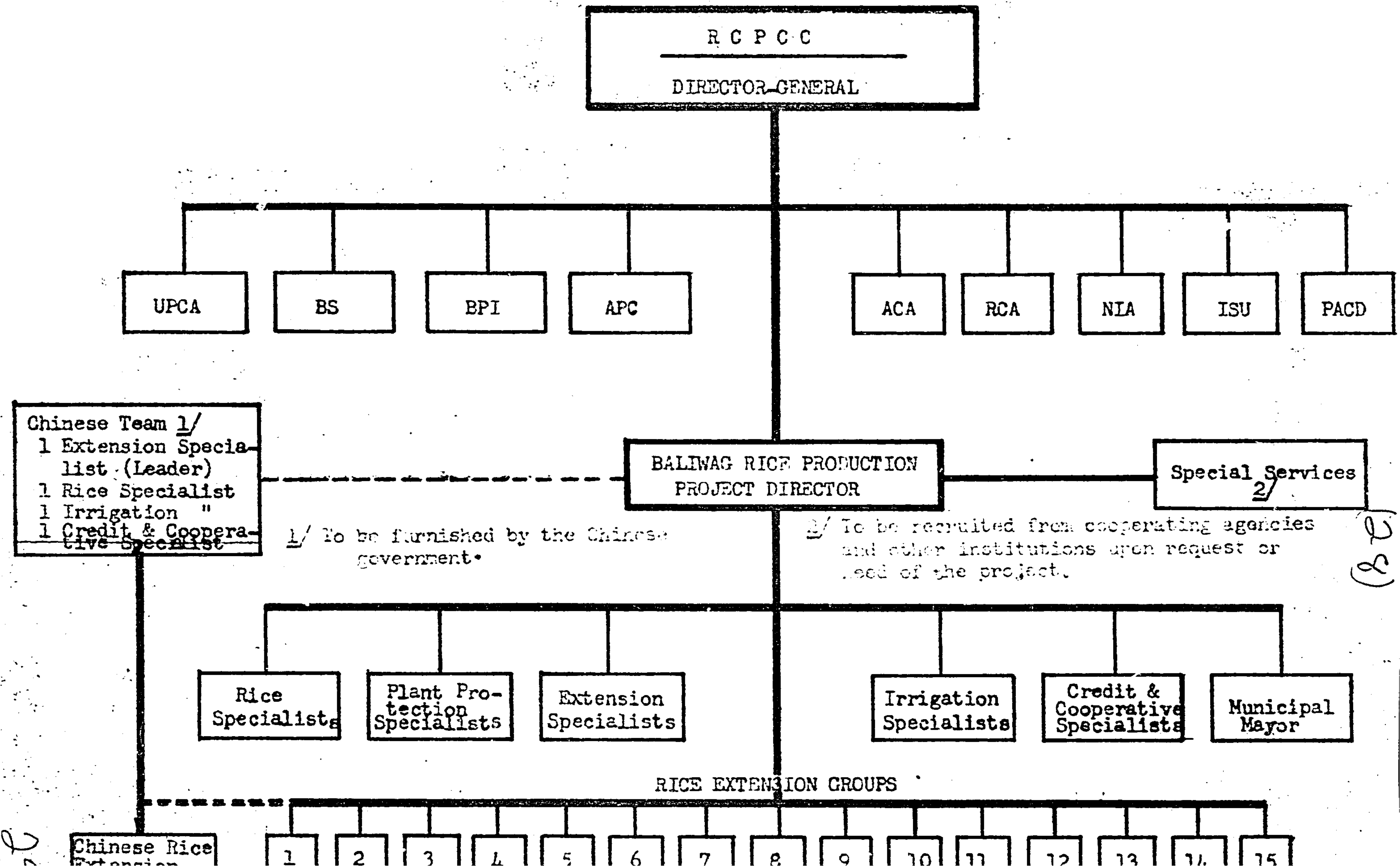
D. Organization

To facilitate project implementation, a project office should be established in Baliuag under the direct supervision of the Director-General of the RCPCC, with an operational staff to be detailed from various agencies and organized as shown in the attached proposed organizational chart in the following page.

PROPOSED ORGANIZATION CHART

for

BALIWAG RICE PRODUCTION & EXTENSION PROJEC



1/ To be furnished by the Chinese government.

2/ To be recruited from cooperating agencies and other institutions upon request or need of the project.

Based on the estimated hectares of rice fields (3,423 has.) and number of rice farmers (1,584) in Baliuag, it is proposed that a total of 50 extension workers including 35 Filipinos and 15 Chinese be organized into 15 extension groups. The following table is suggested for reference purposes. Actual assignment (particularly the number of extension workers in each specific Barrio) will be decided by the project director when the accurate information concerning the number of rice farmers in different barrios is available. In order to demonstrate the recommended practices, the 15 Chinese extension workers will be assigned as the leaders of these extension groups.

The entire project personnel including the project director, operational staff and the Chinese team should be stationed in Baliuag.

Table 2. PROPOSED ASSIGNMENT OF RICE EXTENSION GROUPS IN BALIUAG

Area/Barrio	No. of Rice Farmers	Irrigated Rice fields (Ha.)	Extension Groups			
			Group No.	No. of Ext. Agents		
				China	Philippines	Total
1. Hinukay	60	90				
Paitan	60	198				
San Roque	100	150	No.1&2	2	5	7
2. Piel	46	83				
Sto Niño	55	143				
Barangca	98	154				
Tangos	97	73	No.3&4	2	7	9
3. Sabang	84	112				
Pagala	80	121				
Sto. Cristo	30	135				
Riles	4	5	No. 5&6	2	4	6
4. Sullivan	40	46				
Telepayong	85	154	No. 7	1	2	3
5. Conception	25	47				
Tarcan	40	29				
Pinagbarilan	80	177	No. 8	1	3	4
6. Catantipay	200	341				
Matangtulig	111	502				
Catulinan	54	151	No.9-12	4	8	12
7. Sta Barbara	100	126				
Makinabang	135	586	No.13-15	3	6	9
Total	1,584	3,423	15	15	35	50

E. Farming supplies and credit requirement

Although this project is for a duration of two years, it is unrealistic to prepare at present the estimate of supply requirement for the entire project period because changes are expected in each crop season after the project implementations.

For the crop season of September 1966 - January 1967, the requirement of seeds, fertilizers and pesticides and amount of production loans is estimated as follows:

Table 3. ESTIMATED REQUIREMENT AND PROPOSED SCHEDULE OF DISTRIBUTION OF SEEDS, FERTILIZERS AND INSECTICIDES FOR THE CROP SEASON OF SEPT., 1966 - JAN., 1967

Materials	Hectarage	Requirement per hectare (kg.)	Total Requirement (kg.)	Estimated quantity needed for the distribution (kg.)	Date Needed
Seeds:					
IR-8-288-3	45	44	1,980	2,000	Sept. 1
BPI-76 (Bicol Sel.)	3,355	44	147,620	148,000	Sept. 1
Fertilizers:					
Ammosul 20%	45	400	18,000	800,000	Sept. 25
Ammosul 20%	3,355	300	1,006,500		
Superphosphate	3,400	200	680,000	540,000	Sept. 25
Insecticides:					
Sevin 85	3,400	2.44	8,296	7,000	Sept. 15
Lindane 6% granules	3,400	50	170,000	136,000	Sept. 15

Note: The quantity of fertilizers and insecticidos need for distribution is estimated at 80% of the total requirement.

Table 4. ESTIMATED AMOUNT OF PRODUCTION LOAN NEEDED FOR THE CROP SEASON OF SEPT., 1966 - JAN., 1967

Item	Amount per ha.	Hectarage	Total amount
1/ Land preparation	₱ 170.00	3,400	578,000
1/ Transplanting	80.00	3,400	272,000
1/ Weeding	60.00	3,400	204,000
2/ Seeds	20.00	3,400	68,000
2/ Insecticides	100.00	3,400	340,000
2/ Fertilizers	120.00	3,400	408,000
TOTAL	₱ 550.00	3,400	₱1,870,000

Notes: 1/ in cash. 2/ in kind.

The amount of loan for different items of work required per hectare is based on the production cost-estimate as shown in Appendix 5. However, this estimate is subject to changes due to fluctuations in prices and rates of wages.

F. Operations

1. Before September 1, 1966

Finalization of all necessary preparatory work including documentation, availability of field facilities, information to Baliuag farmers on the purposes of the project, familiarization of the situation in Baliuag by project personnel, etc.

2. Before September 10, 1966

(a) Distribution of rice seeds, fertilizers and insecticides, and release of production loans.

(b) Preliminary training of farmers.

3. Beginning September 14, 1966

(a) Implementation of the proposed standard method of rice culture (see Appendix 6 and Recommendations on Pages 16 to 20) strictly in accordance with the following two proposed operational calendars (Tables 5 and 6). The timing of field operations in each Barrio may be adjusted according to the actual date of sowing.

Table 5. PROPOSED OPERATIONAL CALENDAR FOR SEPTEMBER-JANUARY RICE CROP
(Baliuag, Bulacan)
1966-1967

OPERATION	DATE				REMARKS
1. Seedbed preparation	Sept. 14	Sept. 15	Sept. 16	Sept. 17	
2. Seed treatment	Sept. 14	Sept. 15	Sept. 16	Sept. 17	
3. Sowing	Sept. 16	Sept. 17	Sept. 18	Sept. 19	
4. Land preparation					
Plowing	Sept. 16	Sept. 17	Sept. 18	Sept. 19	
1st harrowing	Sept. 23	Sept. 24	Sept. 25	Sept. 26	
2nd harrowing	Sept. 30	Sept. 31	Oct. 1	Oct. 2	
3rd harrowing	Oct. 4	Oct. 5	Oct. 6	Oct. 7	
5. Transplanting	Oct. 5	Oct. 6	Oct. 7	Oct. 8	
6. Insecticides					
Seedbed application	Sept. 25	Sept. 26	Sept. 27	Sept. 28	Spray Sevin
1st field application	Oct. 16	Oct. 17	Oct. 18	Oct. 19	Spray Sevin
2nd field application	Oct. 31	Nov. 1	Nov. 2	Nov. 3	Broadcast BHC
7. Weeding					
1st	Oct. 15	Oct. 16	Oct. 17	Oct. 18	Hand weeding or herbicide
2nd	Oct. 29	Oct. 30	Oct. 31	Nov. 1	Hand weeding or herbicide
3rd	Nov. 15	Nov. 16	Nov. 17	Nov. 18	If necessary
8. Irrigation					
1st	Oct. 3	Oct. 4	Oct. 5	Oct. 6	Before transplanting
2nd	Oct. 11	Oct. 12	Oct. 13	Oct. 14	
3rd	Oct. 31	Nov. 1	Nov. 2	Nov. 3	
4th	Nov. 15	Nov. 16	Nov. 17	Nov. 18	
5th	Nov. 21	Nov. 22	Nov. 23	Nov. 24	Panicle initiation stage
6th	Dec. 10	Dec. 11	Dec. 12	Dec. 13	Heading stage
9. Drainage					
1st	Oct. 20	Oct. 21	Oct. 22	Oct. 23	
2nd	Nov. 9	Nov. 10	Nov. 11	Nov. 12	Maximum tillering stage
3rd	Nov. 19	Nov. 20	Nov. 21	Nov. 22	
4th	Dec. 1	Dec. 2	Dec. 3	Dec. 4	
5th	Jan. 5	Jan. 6	Jan. 7	Jan. 8	
10. Fertilizer					
Basic	Oct. 4	Oct. 5	Oct. 6	Oct. 7	
Top-dressing	Nov. 20	Nov. 21	Nov. 22	Nov. 23	Panicle initiation stage
11. Harvesting	Jan. 14	Jan. 15	Jan. 16	Jan. 17	

Table 6. PROPOSED OPERATIONAL CALENDAR FOR MAY - SEPTEMBER RICE CROP
(Baliuag, Bulacan)
1966-1967

OPERATION	DATE				REMARKS
1. Seedbed preparation	May 13	May 14	May 15	- - - - -	
2. Seed treatment	May 13	May 14	May 15	- - - - -	
3. Sowing	May 15	May 16	May 17	- - - - -	
4. Land preparation					
Plowing	May 15	May 16	May 17	- - - - -	
1st harrowing	May 22	May 23	May 24	- - - - -	
2nd harrowing	May 29	May 30	May 31	- - - - -	
3rd harrowing	June 3	June 4	June 5	- - - - -	
5. Transplanting	June 4	June 5	June 6	- - - - -	
6. Insecticides					
Seedbed application	May 24	May 25	May 26	- - - - -	Spray Sevin
1st field application	June 15	June 16	June 17	- - - - -	Spray Sevin
2nd field application	June 30	July 1	July 2	- - - - -	Broadcast BHC
7. Weeding					
1st	June 14	June 15	June 16	- - - - -	Hand weeding or herbicide
2nd	June 28	June 29	June 30	- - - - -	Hand weeding or herbicide
3rd	July 8	July 9	July 10	- - - - -	If necessary
8. Irrigation					
1st	June 2	June 3	June 4	- - - - -	Before transplanting
2nd	June 10	June 11	June 12	- - - - -	
3rd	June 30	July 1	July 2	- - - - -	
4th	July 15	July 16	July 17	- - - - -	
5th	July 21	July 22	July 23	- - - - -	Panicle initiation stage
6th	Aug. 10	Aug. 11	Aug. 12	- - - - -	Heading stage
9. Drainage					
1st	June 19	June 20	June 21	- - - - -	
2nd	July 10	July 11	July 12	- - - - -	Maximum tillering stage
3rd	July 19	July 20	July 21	- - - - -	
4th	July 29	July 30	July 31	- - - - -	
5th	Sept. 4	Sept. 5	Sept. 6	- - - - -	
10. Fertilizer					
Basic	June 3	June 4	June 5	- - - - -	
Top-dressing	July 20	July 21	July 22	- - - - -	Panicle initiation stage
11. Harvesting	Sept. 13	Sept. 14	Sept. 14	- - - - -	

(b) Continual training of local extension workers and farmers from time to time.

(c) Implementation of the irrigation drainage work as mentioned in Recommendations Numbers 4 to 10 on Pages 21 and 22.

(d) Implementation of the recommendations pertaining to services to farmers on Pages 23 to 25.

(e) Additional items of work as deemed necessary for implementation of other recommendations presented in Part V of this Report.

VII. APPENDICES

1. Proposed crop pattern and irrigation schedule of Angat river irrigation system
2. Agronomic disease and grain quality data of BPI-76 (Bicol Sel.) and IR8-288-3
3. Handy guide for determining the amount of E. C. formulation required for any desired spray concentration and the amount of granule formulation required for various plot sizes
4. Farmer-family survey form
5. Estimated production cost of rice per hectare
6. Proposed standard method of rice cultivation for the Baliuag Rice Production and Extension Project.
7. A comparison of estimated production cost per hectare under old and projected systems

PROPOSED CROP PATTERN AND IRRIGATION SCHEDULE OF ANGAT RIVER IRRIGATION SYSTEM

TEM / MONTH	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	REMARKS
crops area (Rice)	(2.8) SEEDLING	(2.8)	MAIN FIELD			(2.8) SEEDLING	MAIN FIELD						Baliwag project are included
Zones (5,500 ha.) 1/	1.8	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	1.8			
ne crop area (Rice)				(6.5)	(6.5)								Opportunity cash crop r quiring les water to follow rice
& S. Zones (13,000 ha.)				4.3	13.0	13.0	13.0	6.5					
ne crop (Rice)							(1.5)						"
looded area- N. Zone (3,000 ha.)							3.0	3.0	3.0	3.0	1.0		
crops area (Rice)			(2.8)					(2.8)					
Zones (5,500 ha.) 1/			5.5	5.5	5.5	5.5	3.6	5.5	5.5	5.5	5.5	1.8	
p. Land preparation	2.8	2.8	2.8	6.5	6.5	2.8	1.5	2.8					
m. Main field	1.8	5.5	11.0	15.3	24.0	21.3	24.1	20.5	14.0	10.3	6.5	1.8	
p and Qm	4.6	8.3	13.8	21.8	30.5	24.1	25.6	23.3	14.0	10.3	6.5	1.8	
vailable rainfall			(150mm) 5.4	(150mm) 13.9	(150mm) 13.9	(150mm) 4.6	(150mm) 3.4						
p & Qm - Available rainfall	4.6	8.3	8.4	7.9	16.6	19.5	20.2	23.3	14.0	10.3	6.5	1.8	
rrig. rqt. at intake	9.2	16.6	16.8	15.8	33.2	39.0	40.1	46.6	28.0	20.6	13.0	3.6	
rrig. water diverted in '65	11.5	None	23.2	33.4	30.6	33.2	35.1	38.3	27.6	16.6	None	None	
ater shortage					-2.6	-5.8	-5.0	-8.3	-0.4	-4.0			

Remarks:
1. All figures in the table are approximate estimations.
2. The figure in ( ) represent the amount of water needed for the land preparation.
3. Irrigation water required from October to December is less than available water diverted. The water shortage during the period should be overcome by intensive and good irrigation operation and management.
4. This irrigation schedule could be changed subject to actual conditions.
5. This irrigation schedule also should be changed, when IRRIGATION PHASE OF ANGAT RIVER MULTIPURPOSE project is completed.
6. Unit of discharge in CMS.
7. 1/ Alternate every other year

APPENDIX 2

AGRONOMIC DISEASE AND GRAIN QUALITY DATA OF BPI-76 (BICOL SEL.) AND IR8-288-3

(Cited from report of IRRI 1965)

Characters	VARIETY	
	BPI-76 (Bicol)	IR8-288-3
Grain yield (kg/ha)		
Seeding date		
Jan. '65	4360	6511
June '65	5544	5610
Mean of 2 crops		
Jan. & June	4952	6060
Maturity (days seeding-harvest)		
Jan.	135	128
June	125	129
Mean No. panicles/plant	12	13
Mean plant height (cm)	147	111
Mean lodging (%)	95	3
Diseases		
Tungro Virus	S	I
Bacterial leaf blight	R	S
Blast	S	S
Seed dormancy (%)	70	31
Milled rice yields (%)		
Head		46.5
Total		71.8
Gelat. Temp.	H/I	L
Amylose (%)	25.9	30.0

Footnote: S- Susceptible R - Resistant L - Low

H- High I - Intermediate

APPENDIX 3

HANDY GUIDE FOR DETERMINING THE AMOUNT OF E. C. FORMULATION REQUIRED FOR ANY DESIRED SPRAY CONCENTRATION AND THE AMOUNT OF GRANULE FORMULATION REQUIRED FOR VARIOUS PLOT SIZES

(Cited from IRRI)

Example of the use of nomogram in Fig. 1 (attached) is as follows: Say we want to apply 3 kilograms active ingredient gamma-BHC, in an area of 1 hectare (10,000 sq. m.) and the available material has 6% gamma-BHC. We want to calculate the amount of material needed per hectare.

Steps: (1) Locate and put a dot at 10,000 sq. meters (1 Ha.) at column A;

2) At column B, connect a line from 3 kilos (active ingredient needed per hectare) to 10,000 sq. meters at A;

3) From C, draw a line from 6%, the concentration of BHC in the commercial product to column D, crossing at a point wherein line at Step (2) intersect the vertical line between columns A & B; thereby automatically hitting 50 kgs. at column D. This 50 kgs. represents the required amount of the material containing 6% gamma-BHC needed for one hectare.

By following the above procedures, the amount of E. C. formulation required in ml. could be determined with the use of Fig. 2 (also attached).

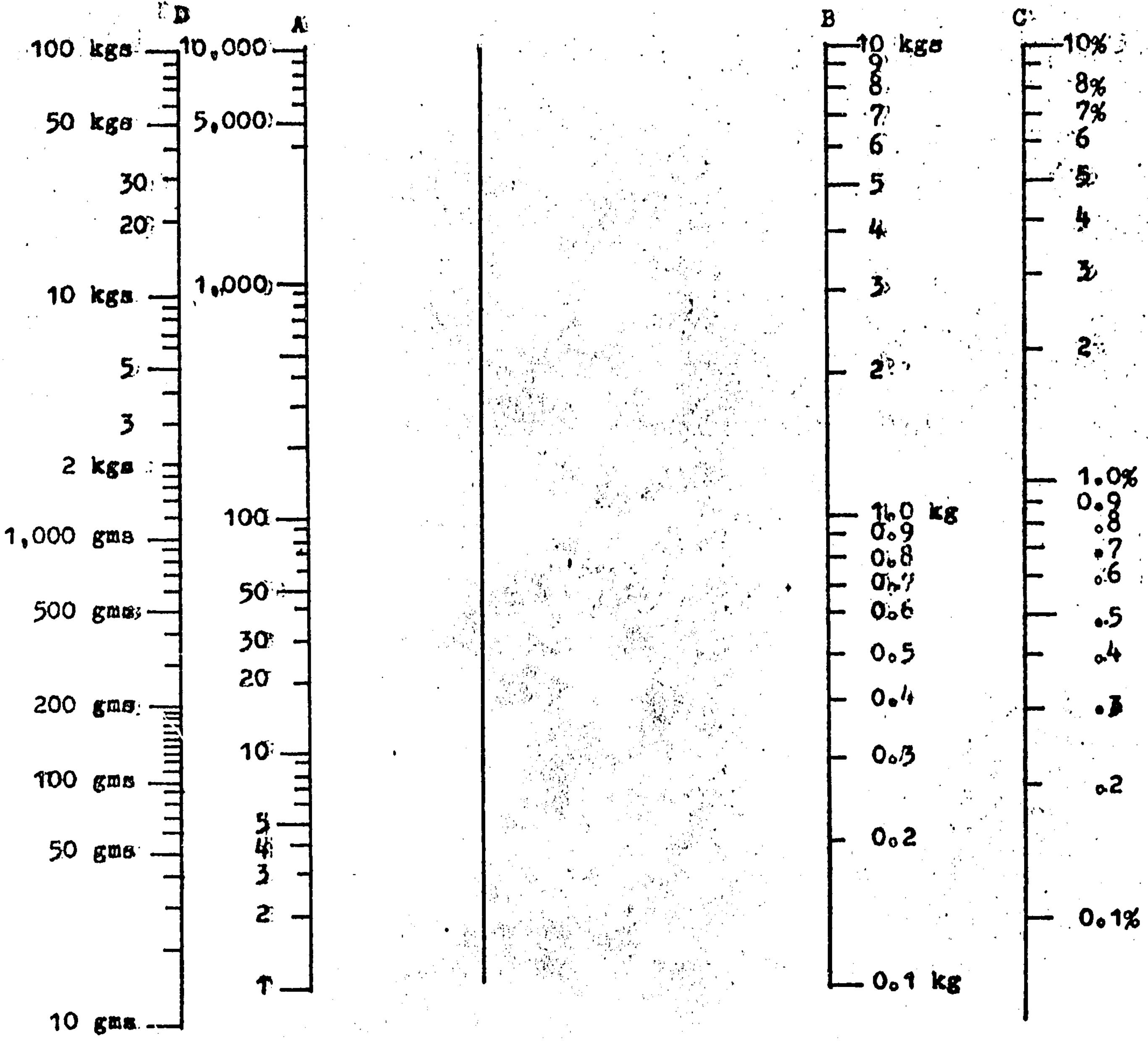


Fig. 1 Nomogram for determining amount of granule formulation required for various plot sizes.

Legend:

A - area to be treated (sq. m.).

B - active ingredient to be applied per hectare (kg).

C - percent concentration of granule to be used.

D - amount required.

(Source: International Rice Research Institute)

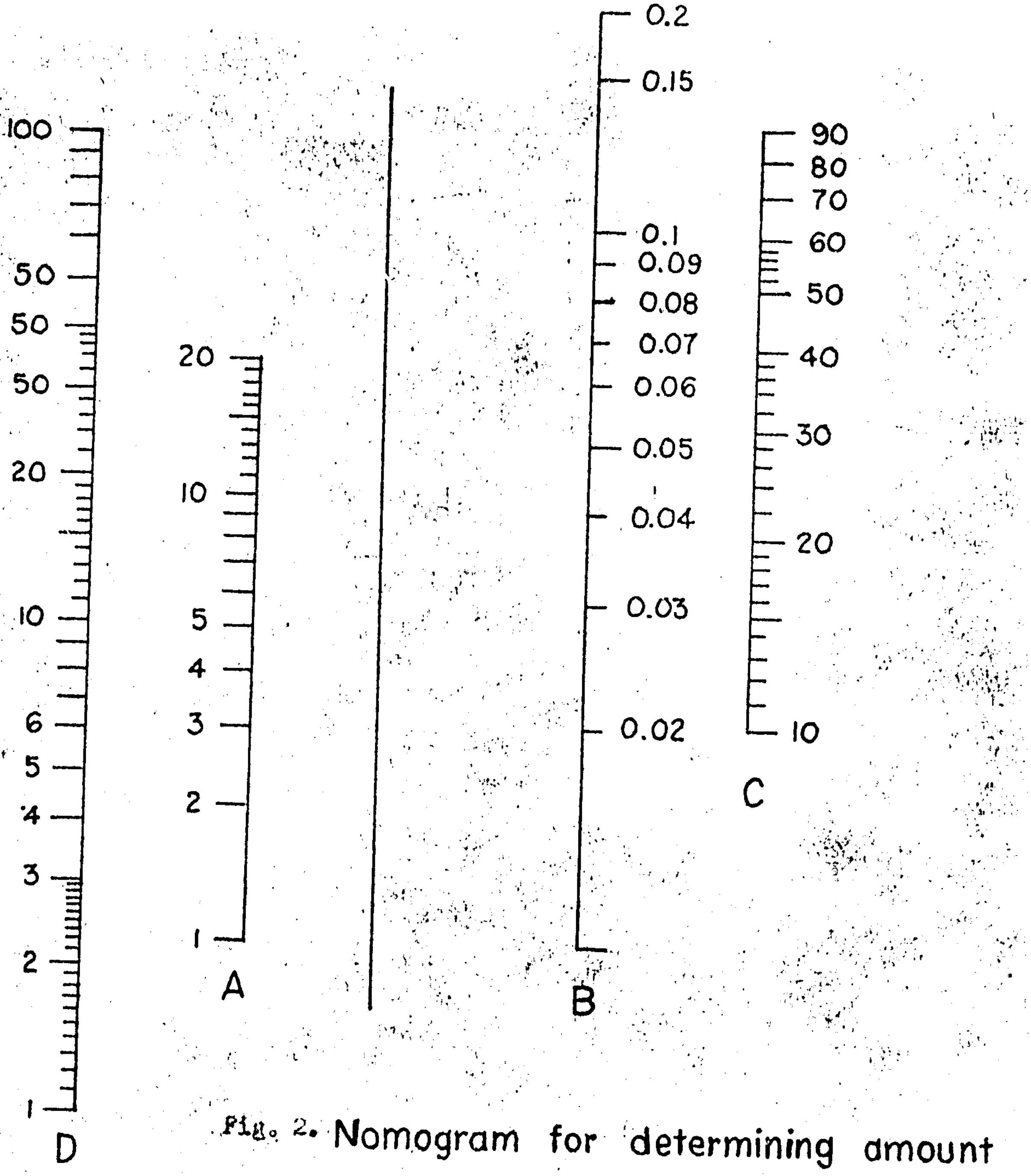


Fig. 2. Nomogram for determining amount of E.C. formulation required for any desired spray concentration.

11

Legend :

A – Vol. of spray to be prepared (liters)
B – Spray concentration desired (%)
C – Percent active ingredient in E.C. formulation (%)
D – Amount of E.C. formulation required (ml)

FARMER-FAMILY SURVEY FORM Date:__________, 1966

Interrogator _________

1. Name: ______________________________, Age: ______

Address: No. ______________, ___________ (Name of barrio).

2. Nos. of family members ______, (_______ engaged in farming, _____ engaged in other work, ______ in school and ____ without job).

3. Hectarage of farm _____ ha. (including _____ ha. self-owned; _____ ha. under tenancy; ____ ha. under leasehold). Basis of crop sharing _____% for tenant; _____% for landowner. Rice field _____ ha. of _1_, _2_ crop(s) in ____________________ (name of barrio).

4. Yield of palay and farm supplies used in previous year:

Item	May-Sept. crop	Sept.-Jan.crop	Remarks
Hectarage			
Variety			
Total yield per ha.			
Average yield per ha.			
Fertilizer applied (bag)			
Insecticides (peso)			

5. Do you have enough income? yes, no;

Do you have any other side-occupation? yes, no; if yes, what?

____

6. Did you borrow money last year? yes, no; if yes, ₱__________ from landowner, neighbor, businessman, relatives or friend, rural bank, FaCoMa, ACA. What interest rate a year did you pay for? ________%.

7. Livestock and poultry raised.

Kinds	Number

8. What are your urgent needs or important problems in rice production? (check)

   Credit: lack of source, lack of capital, high interest, small amount, short term.

   Farm Supplies: lack of supply, high price, poor quality.

   Production : better varieties, fertilizer, irrigation, drainage, farm implements, better farming practices, pesticides.

9. If certain agency can gradually help you solve the above-mentioned problems, are you willing to accept or cooperate? yes, no, no comment.

10. Are you a member of Baliuag FaCoMa? yes, no;
    If yes, will you patronize the FaCoMa after it is revitalized? yes, no, no answer; if no, why? no confidence, poor service, high charge. If you have not yet joined the FaCoMa, do you like to join the FaCoMa after it is revitalized? yes, no, no answer; if no, why? no confidence, poor service, high service charge.

APPENDIX 5

ESTIMATED PRODUCTION COST OF RICE PER HECTARE

UNDER PROPOSED BALIUAG RICE PRODUCTION & EXTENSION PROJECT

Item of Expenses	Family Labor		Hired Labor		Total	
	Days	Pesos (4.00 ea.) 1/	Days	Pesos (4.00 ea.) 1/	Days	Pes
1. Seedbed preparation and care of seedbed 2/	7	28.00	5	20.00	12	48.0
2. Land preparation	7	28.00	44	176.00	51	204.0
3. Pulling and Transplanting	2	8.00	22	88.00	24	96.0
4. Care of Crop 3/	24	96.00	15	60.00	39	156.0
5. Harvesting & Threshing	2	8.00	31	124.00	33	132.0
6. Drying and Storing	8	32.00	-	-	8	32.0
7. Other operating expenses						
a. Seeds (1 cavan)	-	-	-	-	-	20.0
b. Fertilizers	-	-	-	-	-	122.0
c. Containers (80 bags)	-	-	-	-	-	88.0
d. Chemicals	-	-	-	-	-	97.0
e. Irrigation fee	-	-	-	-	-	12.0
f. Food to labor	-	-	-	-	-	20.0
8. Fixed cost 4/	-	-	-	-	-	134.0
TOTAL	50	200.00	117	468.00	167	1,161.0

Estimated Yield per Ha. ...... 3,520 kgs. (80 cavans)

Cost of production per ton ... ₱329.83

Notes:
1/ Based on local current wage.
2/ Includes pulling of seedling.
3/ Includes weeding, irrigation, fertilization and spraying chemicals.
4/ Includes depreciation, 6% interest use of land and tax.

APPENDIX 6

PROPOSED STANDARD METHOD OF RICE CULTIVATION FOR THE BALIUAG RICE PRODUCTION AND EXTENSION PROJECT

(To be translated into Pilipino if necessary)

1. Seedbed preparation:

Locate seedbed in an exposed area near the water source. An elevated bed in strips (preferably across the wind direction) of 1 meter by 20 meters with a one-foot wide ditch in-between is made after thorough harrowing and stirring of the soil. The excess water should be drained out.

2. Seed treatment:

Soak seeds in a 5-10% salt or 5% ammonium sulfate solution. Discard the seeds that will float. Drain the solution. Soak seeds in tap water for 24 hours, then incubate the seeds in a moist warm place for another 36 hours.

3. Sowing seeds:

One kilo of seeds is broadcasted on the surface of the seedbed of 1 meter wide and 10 meters long. Approximately one cavan of seeds is needed for one hectare field.

4. Care of seedlings:

Keep the seedbed in saturated condition for 3 to 5 days after sowing by using the water in the irrigation ditch around the seedbed. Gradually increase the depth of water to just below the tip of the growing seedlings to prevent the young seedlings from being damaged by heavy rain. Spray the seedbed once with 1.5 kg/ha.

active ingredient SEVIN-85 (1.77 kg/ha SEVIN-85) about 10 days before pulling the seedlings.

5. Land preparation:

Plow the field and then flood it for 5 days prior to first harrowing. Repeat harrowing on the 6th day and make the third and final harrowing immediately before transplanting. However, areas cultivated with farm machineries need not necessarily follow the above procedure. Broadcast the fertilizer and mix it homogeneously with the soil during the final harrowing followed by land levelling.

6. Pulling seedlings:

Seedlings are ready for transplanting when they are twenty days old. Irrigate the seedbed, one day before pulling, to soften the soil so as to reduce damage to seedlings. The Taiwan method of spading seedlings from the seedbed instead of pulling may be adopted.

7. Plant spacing:

Spacing depends upon the growth habit of the variety, season, fertilization practice and soil fertility. Generally speaking plants of heavy tillering varieties should be spaced wider. The following spacings are suggested for the two selected varieties:

IR 8 - 288-3 -------- 20 x 20 cm to 20 x 25 cm
BPI-76 (Bicol Sel.) ---- 25 x 25 cm to 25 x 30 cm

However, rectangular spacing (20 x 25 cm and 25 x 30 cm) is more advisable to facilitate weeding and permit sunlight to reach the lowest part of the plants during their tillering stage.

8. Transplanting:

a) Proper time: The time of transplanting is determined by the condition of irrigation water, variety, temperature, monsoon, cropping system and location. For proper planting time of the two selected varieties, see tables 5 and 6.

b) Depth of transplanting:

Too deep planting may cause the formation of additional layer of roots and retard the growth of the plant to a certain extent. The planting at the uniform depth of 2 – 3 cm is recommended.

c) Number of seedlings per hill:

Based on the tillering capacity of the two selected varieties mentioned above, the planting of 3 – 5 plants per hill is suggested.

d) Straight planting: In order to plant seedlings in straight rows at desired spacing, the use of the check-row spacing marker (made in Taiwan) in loamy or a little heavier soil is recommended.

9. Fertilization:

The amount of fertilizer to be applied will depend upon the fertility of the soils and irrigation facilities. Two third of the amount of nitrogen and the whole amount of phosphate and potassium needed should be applied as a basal dressing before transplanting. One third of nitrogen should be applied 60 days before harvesting or 30 days before flowering. However, if at this stage the plants are already dark green, there will be no need of top dressing, in order to avoid lodging. The field should be drained to saturation point before applying the fertilizers.

10. Water management:

a) After transplanting, water should be kept at a depth of 2 - 3 cm when young or small seedlings are used. Increase or reduce the depth of water according to the height of seedlings transplanted.

b) Gradually increase the depth of water (but never beyond 5 cm) as the plants grow taller. The rice fields should be drained in accordance with the periods indicated in tables 5 and 6.

c) Water should be maintained at the flowering time to allow full fertilization of grains.

11. Weed control:

Weeding can be done by using either the rotary weeder or by hand. The first weeding should take place about 10 days after transplanting when weeds start to germinate. The second weeding follows two weeks later. If necessary a third weeding may be made 10 days after. Application of herbicides is suggested if they can be obtained at a low price.

12. Disease and insect control:

The disease and insect control should be undertaken on a community-wide scale. Ten days after transplanting, spray active ingredient SEVIN (2 kg per hectare) to destory leafhoppe Twenty five days after transplanting, broadcast the gamma-BHC into the paddy water at the rate of 3 kg per hectare of the active ingredient (50 kg granular 5% lindane/ha). Keep the water in the field at least 3 days after the application of BHC. A second application of gamma-BHC, if necessary, should be done at the booting stage. (See proposed operational calendars of Tables 5 and 6)

13. Rat and Bird Control:

To control rats use 1080 poison by employing grated coconut, rice, corn, etc. as bait. The above control measures plus trapping, use of cyanide gas and hunting will minimize infestation. Bird damage will be less if the crop is planted to come into head at the same time as the surrounding fields.

14. Harvesting:

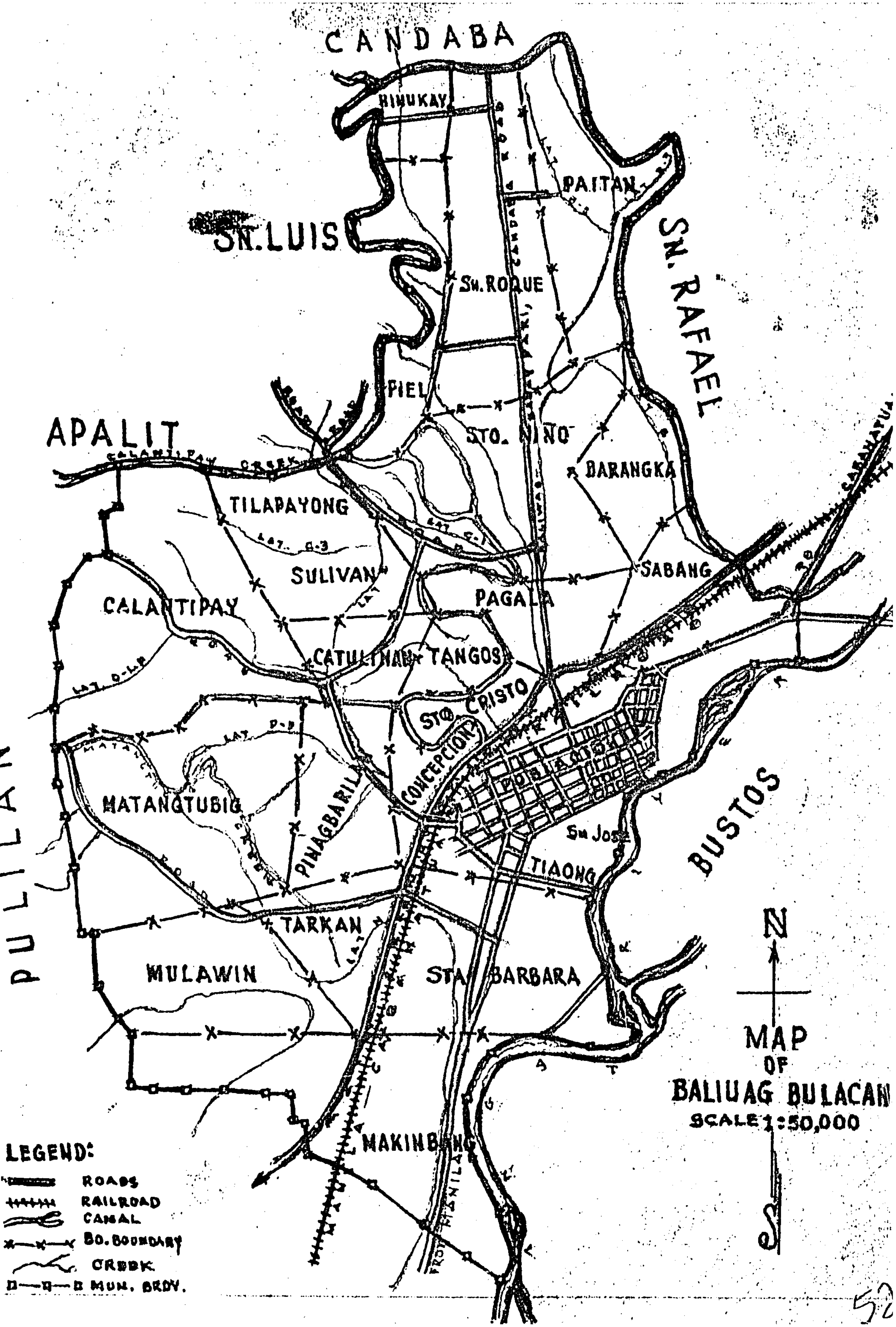
When all the grains turn brownish in color, it is the time for harvesting. It seems that the Taiwan method of harvesting can be adopted in the Philippines. Cut rice stalks with sickles and lay them flat in an orderly manner in the field to dry. Thresh the grains with a two-man operated revolving cylinder-type thresher.

APPENDIX 7

A COMPARISON OF ESTIMATED PRODUCTION COST PER HECTARE UNDER OLD AND PROJECTED SYSTEMS

Item of Expenses	Old System Days	Old System Pesos 1/ (4.00 ea.)	Projected System Days	Projected System Pesos 1/ (4.00 ea.)	Increase Pesos
1. Preparation, sowing, and care of seedbed	5	20.00	12	48.00	28.00
2. Land preparation	44	176.00	51	204.00	28.00
3. Transplanting	18	72.00	24	96.00	24.00
4. Care of crops 2/	6	24.00	39	156.00	132.00
5. Harvesting & Threshing	26	104.00	33	132.00	28.00
6. Storing & Drying	5	20.00	8	32.00	12.00
7. Other operating expenses					
a. Seeds (1 cavan)	-	20.00	-	20.00	-
b. Fertilizers	-	100.00	-	122.00	22.00
c. Containers (gunny sacks)	-	55.00	-	88.00	33.00
d. Chemicals	-	30.00	-	97.00	67.00
e. Irrigation fee	-	12.00	-	12.00	-
f. Food to labor	-	20.00	-	20.00	-
8. Fixed cost 3/	-	134.00	-	134.00	-
TOTAL	104	787.00	167	1,161.00	374.00
Estimated Yield per Ha.		2,250 kg. (51 cavans)		3,520 kg. (80 cavans)	1,270 kg. (29 cavans)
Cost of Production per M/T		₱348.70		₱329.83	₱18.87
Estimated gross income per ha. at ₱16.00 per cavan		816.00		1,280.00	464.00
Estimated net income per Ha.		29.00		119.00	90.00
Estimated Yield for 3,400 Ha. in Baliuag		7,650 M/T		11,968 M/T	4,318 M/T
Estimated gross income for 3,400 ha..		₱2,774,400		4,352,000	1,577,600
Estimated net income for 3,400 ha. ..		₱ 98,600		404,600	306,000
Additional cost under Projected system for 3,400 ha.					1,271,600

Notes: 1/ Based on local current wage at ₱4.00/day.
2/ Includes weeding, irrigation, fertilization and spraying chemicals.
3/ Includes depreciation, 6% interest use of land and tax.



MAP
OF
BALIUAG BULACAN
SCALE 1:50,000